Curriculum Vitae for Philip Georg Sura

Personal Data

Name:	Sura
First name:	Philip Georg
Date of birth:	April 5, 1970
Citizenship:	German
Current address:	NOAA-CIRES Climate Diagnostics Center 325 Broadway, R/CDC1 Boulder, CO 80305-3328 Phone: (303) 497-4426, Fax: (303) 497-6449 E-mail: Philip.Sura@noaa.gov Homepage: http://www.cdc.noaa.gov/people/philip.sura

Professional Experience

07/2002 - present	Research Scientist, NOAA-CIRES Climate Diagnostics Center, Boulder, Colorado (supervisors: Prashant Sardeshmukh and Cécile Penland).
03/2001 - 06/2002	Postgraduate Researcher, Physical Oceanography Research Division, Scripps Institution of Oceanography, University of California, San Diego (supervisor: Sarah T. Gille).
01/1998 - 03/2001	Research Scientist at the Department of Theoretical Meteorology at the University of Hamburg (supervisor: Klaus Fraedrich).
10/1998 - 12/1998	ESF (European Science Foundation) Research-Fellow at the Istituto di Cosmogeofisica, Torino (host: Antonello Provenzale).

Education

01/1998 - 12/2000	Ph.D. Student and Research Scientist at the Department of Theoretical Meteorology at the University of Hamburg. Ph.D. in Geoscience awarded 12/2000 (thesis advisor: Klaus Fraedrich).
04/1992 - 12/1997	Diploma (M.S.) Student in Physical Oceanography at the University of Hamburg. Diploma in Physical Oceanography awarded 12/1997.

Field Work

1996	5 weeks on board *RV Valdivia*: CTD and ADCP measurements, deployment and recovery of thermistor chains.
1995	3 weeks on board *RV Valdivia*: CTD and ADCP measurements, and recovery of moorings.

Languages

German	Native speaker.
English	Fluent (written and spoken).
French	Basic knowledge.

Grants

2004 - 2007	CMG Collaborative Research: Stochastic Forcing of a Coupled Ocean-Atmosphere Model of El-Niño. Proposal submitted to the NSF.
1998	Exchange Grant from the Transport Processes in the Atmosphere and the Oceans program from the European Science Foundation (ESF) to carry out research at the Istituto di Cosmogeofisica, Torino, Italy.

Other Professional Activities

• Reviewer for *Journal of Physical Oceanography, Journal of the Atmospheric Sciences, Geophysical Research Letters, Climate Dynamics,* and *The National Science Foundation (NSF).*

• Graduate students co-advised: Julia Dellnitz (M.S. in Physical Oceanography, University of Hamburg, 2000), Frank Colberg (M.S. in Physical Oceanography, University of Hamburg, 2001).

• Member of the *American Meteorological Society* and the *American Geophysical Union*.

Refereed Publications

• Sura, P., and P.D. Sardeshmukh 2004: Stochastic analysis of sea surface wind vectors: The role of multiplicative noise. *J. Atmos. Sci.*, submitted.

• Sura, P., M. Newman, C. Penland, and P. D. Sardeshmukh, 2004: Multiplicative noise and non-Gaussianity: A paradigm for atmospheric regimes? *J. Atmos. Sci*., submitted.

• Sura, P., and S.T. Gille, 2003: Interpreting wind-driven Southern Ocean variability in a stochastic framework, *J. Mar. Res.*, Vol. 61, 313-334.

• Sura, P., 2003a: Stochastic analysis of Southern and Pacific Ocean sea surface winds. *J. Atmos. Sci*., Vol. 60, 654-666.

• Sura, P., and J. Barsugli, 2002: A note on estimating drift and diffusion parameters from timeseries, *Phys. Letts. A*, Vol. 305, 304-311.

• Sura, P., and C. Penland, 2002: Sensitivity of a double-gyre model to details of stochastic forcing. *Ocean Modelling*, Vol. 4, 327-345.

• Sura, P., 2002: Noise-induced transitions in a barotropic β-plane channel. *J. Atmos. Sci*., Vol. 59, 97-110.

• Sura, P., K. Fraedrich, and F. Lunkeit, 2001: Regime transitions in a stochastically forced double-gyre model. *J. Phys. Oceanogr*., Vol. 31, 411-426.

• Sura, P., F. Lunkeit, and K. Fraedrich, 2000: Decadal variability in a simplified wind-driven ocean model. *J. Phys. Oceanogr*., Vol. 30, 1917-1930.

Other Publications

• Sura, P., 2000: *Der Einfluß externen Rauschens auf die Klimavariabilität in vereinfachten Modellen*. Ph.D.-Thesis, University of Hamburg, 111 pp.

• Sura, P., 1997: *Interdekadische Variabilität in einem vereinfachten windgetriebenen Ozeanmodell*. Diploma-Thesis, University of Hamburg, 85 pp.

Recent Conference Contributions and Invited Talks

- 5th AIMS Dynamical Systems Conference, Pomona, 2004: *Multiplicative Noise and Non-Gaussianity: A Paradigm for Atmospheric Regimes?*

- First EGU General Assembly, Nice, 2004: *Multiplicative Noise and Non-Gaussianity: A Paradigm for Atmospheric Regimes?*

- 84th AMS Annual Meeting, Seattle, 2004: *A Stochastic Perspective on Atmospheric Regime Behavior*.

- Physical Oceanography Seminar Series, Woods Hole Oceanographic Institution, Woods Hole, 2003: *A Stochastic Perspective on Oceanic and Atmospheric Regime Behavior.*

- 28th Annual Climate Diagnostics and Prediction Workshop, Reno, 2003: *A Stochastic Perspective on Atmospheric Regime Behavior.*

- 14th AMS Conference on Atmospheric and Oceanic Fluid Dynamics, San Antonio, 2003: *Complex Rossby Wave Behavior Induced by Stochastic Parameterizations.*

- AGU Ocean Science Meeting, Honolulu, 2002: *Interpreting Wind-Driven Southern Ocean Variability in a Stochastic Framework.*

- Applied Mathematics Colloquium, Illinois Institute of Technology, Chicago, 2002: *Multiplicative Noise in Atmospheric Dynamics: Modeling and Observations.*

- AGU Fall Meeting, San Francisco, 2001: *Stochastic Analysis of Southern and Pacific Ocean Sea Surface Winds.*

AGU:	American Geophysical Union
AIMS:	American Institute of Mathematical Sciences
AMS:	American Meteorological Society
EGU:	European Geophysical Union

Summary of Research Experience

My previous and present research investigates the dynamical role of additive and, in particular, multiplicative stochastic perturbations within the atmospheric and oceanic general circulation, using models and observations. In stochastic atmospheric and oceanic models noise is introduced primarily as an additive process, where the strength of the noise is held constant and does not depend on the state of the system. However, the stochastic terms may also appear as multiplicative (that is, state-dependent) noise. Multiplicative noise is often identified with state-dependent variations of stochastic feedbacks from unresolved system components, and may be treated as stochastic perturbations of system parameters. The careful study of stochastic parameterizations, or stochastic geophysical fluid dynamics, is important because the classic view of meteorologists and oceanographers places a great deal of emphasis on how processes at different time and spatial scales may be studied in isolation from each other. While this scale separation approach is indeed useful in many cases, its application to nonlinear systems is ambiguous. My research shows how this ambiguity can be reduced by applying modern stochastic methods and rigorous stochastic parameterizations to geophysical fluid dynamics.

The general idea of stochastic climate models was introduced by Hasselmann (1976)[1] and is based on the Brownian motion analog: the observed red spectrum of oceanic fluctuations is a consequence of the amplification of low-frequency weather fluctuations. Stochastic climate models with additive noise have been surprisingly successful in describing a broad frequency band of oceanic variability. The success of this concept has inspired researchers to consider stochastic atmospheric forcing as a possible source of more complex ocean dynamics. For example, Sura et al. (2000), Sura et al. (2001), and Sura and Penland (2002) have studied the impact of an additive stochastic wind forcing on the oceanic double-gyre circulation.

As already mentioned, stochastic forcing may also represent the fluctuations of model parameters due to unresolved system components. Then, the stochastic terms appear as multiplicative noise. Sura (2002) and Sura et al. (2004) suggest that the state dependent character of the rapidly varying physical processes could be an important factor in understanding and predicting the regime behavior of atmospheric dynamics. Furthermore, Sura (2003,2004) and Sura and Barsugli (2002) have shown that multiplicative noise is indeed essential to describe the observed non-Gaussian synoptic variability of zonal and meridional midlatitude sea surface winds.

The impact of such a state dependent, non-Gaussian wind forcing on the variability of the Antarctic Circumpolar Current (ACC) was studied by Sura and Gille (2003). A simple stochastic model showed that non-Gaussian forcing could have a significant impact on the velocity (or transport) probability density functions (PDFs) of the wind driven circulation. The net oceanic damping determines whether the distribution of the oceanic flow is Gaussian (small damping) or resembles the distribution of the atmospheric forcing (large damping). Thus, to interpret oceanic variability in a physical meaningful sense, the impact of a non-Gaussian wind forcing on the ocean circulation will need to be explored in the future using more sophisticated models.

1 Hasselmann, K., 1976: Stochastic climate models. Part I. Theory. *Tellus*, Vol. 28, 473-484.

References

Dr. Prashant Sardeshmukh
NOAA-CIRES Climate Diagnostics Center
325 Broadway, Boulder, CO 80305-3328
Phone: (303) 497-6248
Fax: (303) 497-6449
E-mail: Prashant.D.Sardeshmukh@noaa.gov

Dr. Cécile Penland
NOAA-CIRES Climate Diagnostics Center
325 Broadway, Boulder, CO 80305-3328
Phone: (303) 497-6234
Fax: (303) 497-6449
E-mail: Cecile.Penland@noaa.gov

Prof. Sarah T. Gille
Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Drive
La Jolla, California 92093-0230
Phone: (858) 822-4425
Fax: (858) 534-9820
E-mail: sgille@ucsd.edu

Prof. Klaus Fraedrich
Meteorologisches Institut
Universität Hamburg
Bundesstraße 55
D-20146 Hamburg, Germany
Phone: +49 40 42838-5064
Fax: +49 40 42838-5066
E-mail: fraedrich@dkrz.de